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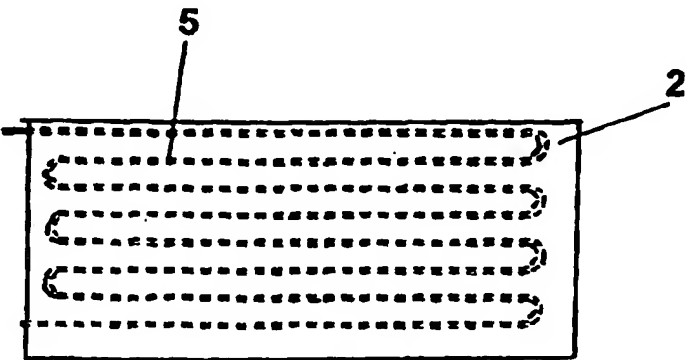
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/NO96/00229 (22) International Filing Date: 27 September 1996 (27.09.96) (30) Priority Data: 953858 29 September 1995 (29.09.95) NO (71) Applicant (for all designated States except US): NORSK HYDRO ASA [NO/NO]; N-0240 Oslo (NO). (72) Inventors; and (75) Inventors/Applicants (for US only): WATHNE, Einar [NO/NO]; Hvalstadåsen 29, N-1364 Hvalstad (NO). THRANE-NIELSEN, Haakon [NO/NO]; N-9780 Lebesby (NO). (74) Agent: RICANEK, Ivan; Norsk Hydro ASA, N-0240 Oslo (NO).		(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>
(54) Title: BUILDING ELEMENT  (57) Abstract A building laminate comprises a supporting plate (2) of foam-aluminium joined together with a surface layer (3) by means of an adhesive having an optimal adhesion to both components. The supporting plate may be provided with a tube sling (5) for the cooling/heating of the surface layer (3).		

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Building element

The present invention relates to a composed wallboard (a laminate) and more specifically to a facade/floor board.

Large modern buildings as office buildings and public buildings as museums, theatres etc. often are provided with boards both at the inside and the outside thereof, the boards having for instance specular/reflective properties, decorative stones/slabs etc. The selection of materials, a relatively high weight/volume and labour-consuming production/assembling accompanied by high costs, will represent an obvious limitation for a broader implementation of such boards also in other types of buildings.

It is therefore an object of the present invention to provide a new type of laminate that is substantially lighter than the previously known/applied boards, the laminate being more simple to produce and to assemble.

Another object of the invention is to provide a facade board having an attractive, colour stable appearance that will not deteriorate even under extreme climatic conditions with intensive sun radiation in tropical/subtropical areas.

A further object of the invention is to provide a laminate having a built-in tube system for the circulation of a medium to achieve an effective cooling/heating of the surface of the laminate.

These and other objects and characteristic features of the invention and its preferred embodiments are achieved by a laminate as described in the claims and the detailed description of the invention with reference to the Figures 1-2, where

Fig. 1 shows schematically in an vertical cross-section the construction of the laminate, and

Fig. 2 illustrates the laminate in a horizontal section along the line I-I in Fig. 1.

Fig. 1 illustrates schematically the laminate 1, comprising a supporting plate 2 joined to a thinner top layer 3 by means of for instance a thin layer of adhesive (not shown in the figure). The supporting plate 2 is according to a preferred embodiment of the invention made from foam-aluminium, preferably reinforced by non-metallic (ceramic) particles, of the type described in Norwegian Patent No. 172 697. Characteristic features of this type of foam-aluminium is that it has good mechanical properties and low weight (up to 90 % reduction in weight compared to matrix Al-material) together with good insulation properties regarding both thermal and acoustic insulation.

Fig. 2 illustrates a preferred embodiment of the laminate, where the supporting plate 2 is further provided with a plurality of grooves/recesses, arranged substantially parallel to each other, for the installation of a tube system shown in the Figure as tube sling 5. The tubes form part of a circulation system (not shown in the Figure) for cooling or heating of the top layer 3 when required, depending on the application of the laminate. Cooling/heating medium may circulate serially as shown in the Figure or in a parallel manner, respectively. The tubes, tube connections and the support/mounting of the supporting plate to a possible suspension frame are made from a compatible Al-material (alloy), to eliminate the problems related to galvanic corrosion.

Another preferred embodiment of the laminate according to the invention comprises a top layer 3 made from a thin split natural slate, for instance a black surface-centered Finnmark-slate joined to foam-aluminium by adhesive means. According to this embodiment there is provided a novel type of facade boards having special/unique properties. The commercially applied specular glass areas will become polluted both outside and inside, and there will gradually develop a deposit at the underside thereof caused by a corroded deposit in the solar heat collector. This influences the appearance in a negative manner, with fading, tinting colours and heat transfer properties, leading to a vast reduction in the heat absorption even as early as 5-7 years after installation. The novel material provides a maintenance-free, colour stable solar heat collector with low weight due to the thickness of the applied slate plates. The thickness of said plates may be in the range of 1.5-2.5 mm. The total weight per square metres of the laminate will be about 22 kilos dependent on the thickness of the slates and the thickness of the supporting foam-aluminium (20-40 mm), a feature which is very advantageous with respect to transport and when performing assembling at the building site. The facade boards may be handled by manual operations and thus special crane equipment will not be required. The black, surface-centered slate surface with bounded graphite is totally waterproof, colour stable and has high tensile strength values.

Long run tests conducted on this material show that the material will neither fade nor foul, even when exposed to corrosive environments for 50 years. The laminate may be manufactured according to desired standard sizes as (conventional) two-component adhesive systems are applied in joining together the slate plates and the foam-aluminium preceded by possible priming of the contact surface of the slate.

A further advantage of using foam-aluminium as supporting plate material is that the material is easy to process, and the pattern of grooves for the installation of tubes may even be stamped/pressed into the plate material as an alternative to milling, thus obtaining a process that saves material and that is benign with respect to the environment.

The laminate boards may, in addition to the application as facade boards, be applied as wall elements that are free-standing or integrated in roof or floor constructions with or without a built-in tube system for heat absorption and/or heat emission (cooling).

Claims

1. A laminate (1) comprising a supporting plate (2) joined together with a surface layer (3),
characterised in that
the supporting plate (2) is made from foam-aluminium.
2. Laminate according to claim 1,
characterised in that
the supporting plate is provided with a plurality of substantially parallel grooves for the assembling of a tube sling (5), for the cooling/heating of the surface layer (3).
3. Laminate according to claim 1 or 2,
characterised in that
the surface layer (3) comprises thin split natural slates fixed to the supporting plate (2) by means of an adhesive having an optimal adhesion to both natural slate and foam-aluminium.
4. Laminate according to claim 3,
characterised in that
the thickness of the slate layer is 1 to 3 mm.
5. Laminate according to one or more of the foregoing claims,
characterised in that
the laminate is applied as a facade board.

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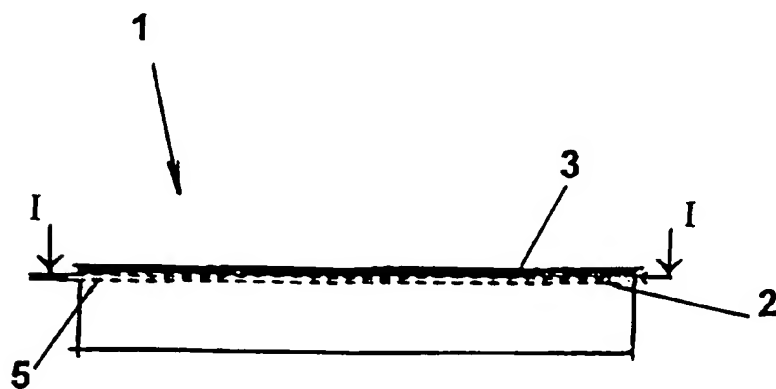


Fig. 1

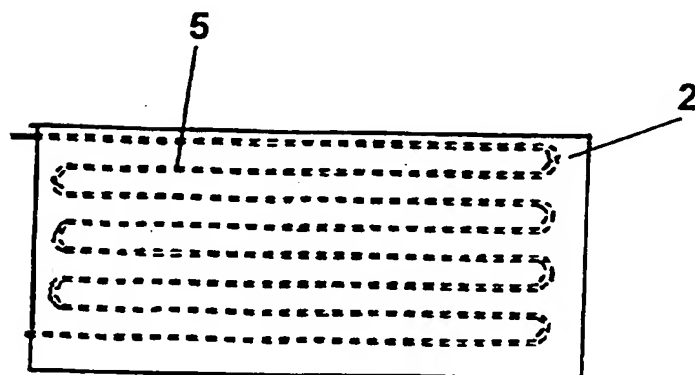


Fig. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO 96/00229

A. CLASSIFICATION OF SUBJECT MATTER		
IPC6: B32B 5/18, B32B 15/04, E04C 2/26 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
IPC6: B32B, C22C, E04C		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0210803 A1 (DIRECTOR-GENERAL OF THE AGENCY OF INDUSTRIAL SCIENCE AND TECHNOLOGY ET AL), 4 February 1987 (04.02.87), abstract, example 5 --	1-5
A	WO 9101387 A1 (NORSK HYDRO A.S.), 7 February 1991 (07.02.91) --	1-5
A	DE 2814004 A1 (WOERMANN, BAUCHEMIE-HOLDING AG), 11 October 1979 (11.10.79), figure 1 --	2
A	WO 9105929 A1 (OWENS, CHARLES, R.), 2 May 1991 (02.05.91), page 10, line 30 - line 33, abstract --	3
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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A1- 0210803	04/02/87	CA-A- 1267550 JP-A- 62171916 US-A- 4713277 JP-B- 1051528 JP-C- 1566284 JP-A- 62020846 JP-C- 1616214 JP-B- 2040239 JP-A- 62152199	10/04/90 28/07/87 15/12/87 06/11/89 25/06/90 29/01/87 30/08/91 10/09/90 07/07/87
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DE-A1- 2814004	11/10/79	NONE	
WO-A1- 9105929	02/05/91	AU-A- 6726890 EP-A- 0496826 US-A- 5208086 US-A- 5314554	16/05/91 05/08/92 04/05/93 24/05/94

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